Journal Homepage: - www.journalijar.com
INTERNATIONAL JOURNAL OF ADVANCED RESEARCH (IJAR)
Article DOI: 10.21474/IJAR01
DOI URL: http://dx.doi.org/10.21474/IJAR01

RESEARCH ARTICLE

National Conference on Innovation in Science, Engineering and Management (NCISEM-2022)
Date of Conference 11-12 March 2022

DRIP IRRIGATION SYSTEM USING BLDC MOTOR DRIVEN DIRECT PUMPING AND SOIL MOISTURE SENSOR

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Manuscript Info

Key words:-
Solar panel ,BLDC Motor, Drip Irrigation System, Proportional Integral Soil Moisture Sensor GSM, Microcontroller ATM328P

Abstract

In the field of agriculture the most important part is: firstly, to get the information about the fertility of soil and secondly moisture content of soil. In these types of system water is applied to field on the basis of fixed intervals which required high manpower for monitoring and also it reduces the field efficiency. It is the proposed solution for the now a days energy crisis for the Indian farmers. Cost-effective solar power can be the answer to our energy needs. Solar powered smart irrigation systems are the acknowledgement to the Indian farmer. This system does not work at night in areas without a grid. This system uses pressurized water generator from direct water pumping driven by brushless DC (BLDC) motor. Combination of PI control, soil moisture sensor and BLDC motor driven pump makes this system more efficient in using water and electricity than conventional drip irrigation systems. In the future, this drip irrigation system will be combined with solar panels to make it moreefficient.

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Introduction:-

Nowadays each and every economic sector growing rapidly by using new technologies and machines. These machines and new high-tech technology help to grow faster, but on the other side due to the lack of optimization our agriculture sector could not growing at that level like other sectors. Automation is the necessity of the farming. So, the farmer can grow better crop for the future. Automation leads farmers to the better cultivationaswell as the better lifestyle. Our country's more opportunity to grow quickly with a limited source of new technology. Most of the work they have to do with their bare hands, no automatic machines are available for their work. Hence the use of new technology can uplift their agriculture sector. For that they need proper irrigation. Soil moisture, climate condition, temperature and humidity are the important factors of the farming. On which the growth of agriculture crop depends. One can't control all the factors for the growth of crops except soil moisture.

Irrigation is the most important part of agriculture for farmers. The plant needs a certain amount of water when they are going to grow on land. The farmers fulfil this water demand through wells, channels and etc. using pumps. Most of the times farmer having their lands at remote locations. For, irrigation farmer has to go to that location and turns

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ON and turn OFF the pump manually. it consumes so much time and energy. For that, we made an automatic system that measures soil moisture every second and it sends to the server. So, the farmers can see this data on his smartphone in real-time. After measuring moisture our system automatically decides either the pump has to turn on or off, if moisture gets low it turns on the pump if the condition opposite of it then it turns off the pump and saves lots of water and energy. This system can help the agriculture sector to grow rapidly Smart irrigation is of the essence. Not only is smart water management necessary to save water and combat scarcity, it is necessary to help our global food system adapt to a potentially harsh and uncertain future. Smart Irrigation can also improve the quality of crops reducing the percentage of bad crops. For example, in arid regions of the Middle East, improved water management in agriculture has notably augmented both water and foodsecurity

Smart irrigation system that can monitor and store data from fields. It can be deployed on small to medium scales with low cost, low power connectivity, and low cloud connectivity for storage and computational capabilities which makes it such an attractive solution to many of today's problems but as coverage of it is limited, GSM is much more advantageous in large scale field. GSM is an open and digital cellular technology used for transmitting mobile voice and data services operate at the 850MHz, 900MHz, 1800MHz, and 1900MHz frequency bands. The most obvious advantage of GSM is its widespread use throughout the world. According to Gsmworld.com, GSM has a harmonized spectrum, which means that even though different countries may operate on different frequency bands, users can transfer seamlessly between networks and keep the samenumber.

Generally water pump are regulated on gasoline or petrol diesel only which is nonrenewable which cause pollution and is highly expensive. So using renewable source of energy like solar energy must be implemented in action.Generally water pump are regulated on gasoline or petrol diesel only which is non renewable which cause pollution and is highly expensive. So using renewable source of energy like solar energy must be implemented in action.

Literaturereview:-

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This paper talk about the economic condition of water level in India and the comparative study of surface irrigation In this study, we compare drip irrigation systems driven by Brushless DC motor between time-based control and soil moisture sensor-based control. Irrigation system with time- based control requires a fixed amount of water and electricity for each irrigation period, while the drip irrigation system with soil moisture sensor-based control requires different amounts of water and electricity for each irrigation period according to conditions of planting media. The water pressure control uses Proportional-Integral method while the water supply control uses hysteresis control. The PI control parameters are determined using Ziegler-Nichols method. The results show that the closed- loop control system is more efficient in requiring amount of water and energy of 46.2% and 44.8%,respectively.

[1] Harishankar Suresh, R Sathish Kumar, Vignesh Umasankar, ViveknathThulasi India Volume: 4 Advance in Electronic and Electrical Engineering At: Jawaharlal Nehru University, New Delhi, January2014.

This paper has highlighted the actual implement, an automated drip irrigation system uses solar power as an energy source for driving the circuitry of system. This system helps to reduce unnecessary wastage of water and uses energy obtained from natural sources. It helps in saving substantial amount of water as water supply is directly to the crop rather than the land around and that helps in significant reduction in water wastage. With the help of WSN technology it is possible to monitor andcontrol.

The environmental conditions as soil moisture, humidity, salinity etc. for drip irrigation. Solar energy is stored in a battery using solar panel, converting into an electrical energy is an efficient way of consuming natural sources of energy.

This irrigation project has a major benefit for future visionary as this system has water and nutrients saving potential by allowing water directly into the root zone and minimize evaporation. Thus, the objective of this paper is to find the perception of farmers who have adopted to drip irrigation, the reason for adopting and to find the reason for the non-adoption of the drip irrigation from the farmers who have not adopted the technology.

Methodology:-

In this system Solar energy employ from solar panels to automatically pump water from bore well directly into a ground level storage tank depending on the intensity of sunlight. This system saves a substantial amount of energy and efficient use of renewable energy. In this system we use a soil moisture sensor that detects presence of moisture in the soil and depending upon the presence of moisture content required for the crop the water flow is regulated. Thus, this system conserves water by avoiding over flooding of crops. This irrigation system mainly consists of twomodes.

An automatic irrigation mode and solar pumping mode. Both this mode is governed and control by microcontroller ATmega328.In solar pumping mode a pair of solar plates is mounted near a pump set converts solar energy into an electrical energy. After uploading the program to the ATmega328p and providing supply to the components. The soil moisture sensor send signal to the ATmega328p. Relay is connected between the ATmega328p and the pump. Relay is use to protects the controller circuit from over voltage. One can control the pump by getting signals from ATmega328p. It has a Wi-Fi module for communication, by using this module one can send and receive data to the server through the Wi-Fi. When one places our setup on any farm or in a garden. The moisture sensor continuously monitors the moisture value of the soil and sends data to the ATmega328p and checks the soil moisture value is below the threshold value or not. If this value is below the threshold value. The ATmega328p generates the signal for a relay to start the pump. If the condition is not satisfied the ATmega328p sends the signal to the relay to turn off the pump. The irrigation stops after a certain amount of moisture gain by the soil, in this whole process. The readings of soil moisture, temperature, and humidity are taken by the various sensors like soil moisture and DHT11 are send to the server and this data one can see on the smartphone using the internet in real-time. This processis automatically done by ATmega328p. It can work continuously for 24 hours and 365 days of the year. For irrigation purposes, it saves a tremendous amount of water.

The electrical energy is supplied to water pump, water is temporarily stored in a water tank before releasing it to the crop field.The water outlet valve of the tank is electronically controlled by soil moisture sensor. Soil moisture sensor placed in a crop field measures the moisture content of the soil in which the crop is being cultivated. The numerical values which include battery percentage and moisture content is displayed on LCD display. As when there will be overflow of water buzzer will indicate and GSM model is used to get notification.

Block Diagram Description:-

This block diagram consists of two sections one is transmitter section and other is receiver section. The transmitter section consists of solar panel, charge controller, battery and soil moisture sensor and receiver section consist of microcontroller, GSM, DC water pump.

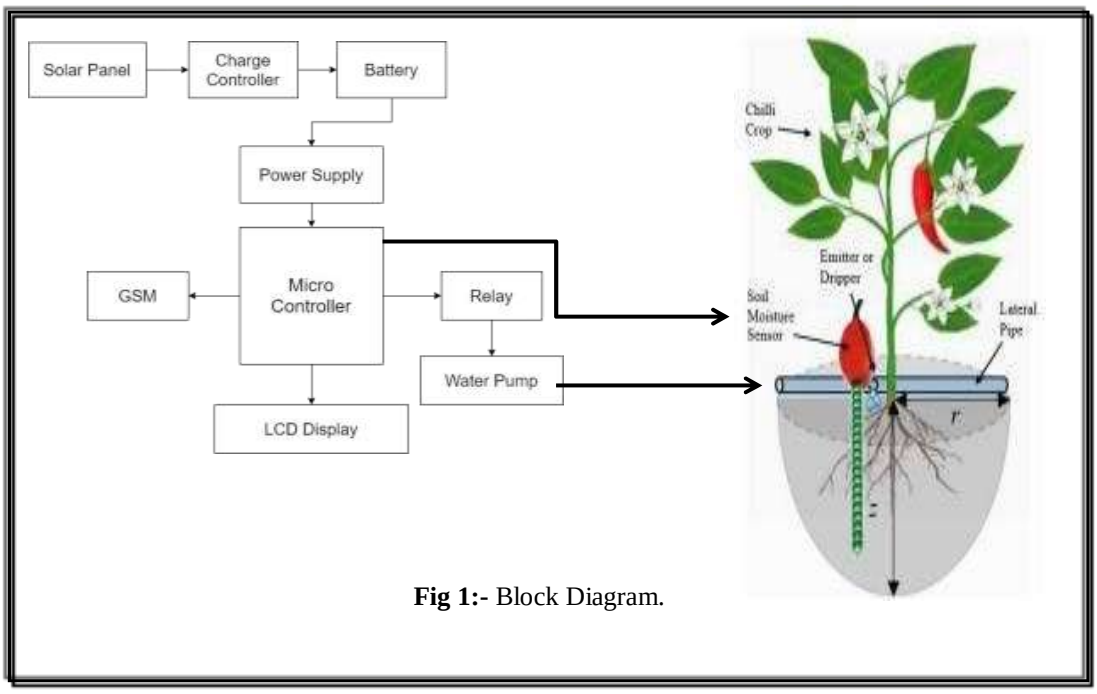

Fig 1:- Block Diagram.

When the power supply is given to ATmega 328p microcontroller, the moisture sensors transmit data to the microcontroller then monitors the data and finally send to the receiving section where the user's smartphone receives data and accordingly show the data of soil moisture level.

Soil moisture sensor is used to check whether the soil is wet or dry. If the moisture of soil is less, microcontroller turn on the pump through GSM and starts the irrigation and if the moisture is more than a specific level then it sends notification to user's mobile then user will send the message andthen it will stop the irrigation by turning of the water pump.

Soil moisture sensormodel.
Soil moisture sensor is a sensor to determine depth of water absorption around emitter droplets. In this simulation, we need water distribution pattern and wetting pattern under drip irrigation. Many researchers develop mathematical models that are quite complex and require detailed information about nature of soil. Simple empirical models for determining leach geometry patterns are more often used than dynamic models

In this study, water absorption geometry patterns were used as a model of soil moisture sensors. Illustration of geometric pattern of infiltration and position of soil moisture sensor. Module A moisture sensor is used to sense the level of moisture content present in the irrigation field. It has a level detection module in which we can set a threshold value. Automatic regulation for automatic control with the help of moisture sensor signal and a controller, a control pulses is given to the driver circuit that excites the motor. So, this way the pump is ON or OFF depending upon the amount of moisture present in the soil of the field. When the soil moisture content reaches the required value, the Pump is fully shut off and power to driver circuit is killed and controller is put into sleep mode for low power consumption. When the moisture in soil is desiccated and reach a minimum cut-off value, the controller comes out of sleep mode and flow of water is regulated. This way the whole system worksautomatically.

DCMotor
A DC motor is an electric motor that runs on direct current (DC) electricity. In any electric motor, operation is based on simple electromagnetism. A simple 2-pole DC electric motor here red represents a magnet or winding with a "North" polarization, while green represents a magnet or winding with a "South" polarization. Every DC motor has six basic parts -- axle, rotor, stator, commutator, field magnet(s), and brushes Fig. 2 Infiltration geometry pattern and position of soil moisture sensor Solar Panel Solar panel is an assembly of photovoltaic (PV) cells electrically connected and mounted on a supporting structure. Photovoltaic (PV) cells are made of special materials called semiconductors such as silicon. Basically, when light strikes the cell, a certain portion of it is absorbed withinthesemiconductor material. The electricity produced is called direct current (DC) and can be used immediately or stored in abattery.

Battery
An electrical battery is a combination of one or more electrochemical cells, used to convert stored chemical energy into electrical energy. In this proposed system, we used battery for storage of electricity produced by solar panels. The stored energy further used for operation of the irrigation system.

Pressure Control and Infiltrationdepth
Control
Drip irrigation controller in this study uses cascade control method. This method consists of water pressure control and water infiltration depth control. The control of irrigation water pressure uses Proportional Integral (PI) method. The PI control strategy is chosen because it has immunity to variations in plant parameters that lead to invariant dynamics and static responses The PI control regulates the motor voltage which results in a change in motor speed which will result in changes in water pump discharge and then in irrigation networkpressure.

Objectives:-

Thus, the objective of this paper is to find the perception of farmers who have adopted to drip irrigation, the reason for adopting and to find the reason for the non-adoption of the drip irrigation from the farmers who have not adopted the technology

1. To avoid losses in agriculture because ofclimatic changes.
2. To increase product efficiency andreducing overallcosts.
3. To enhance resilience of farms and thefarming community to climate risks so as to ensure sustainability over

a period oftime.

4. Drip irrigation systems driven by Brushless DC motor between time-based control and soil moisture sensor-basedcontrol.

Advantages

1. Farmers can control land moisture froma remotelocation.
2. Increasesproductivity.
3. Farmers can invest time in other vitaltasks.
4. It is very easy to design and implement.It will save farmers time andmoney.

Conclusion:-

Irrigation becomes straightforward, correct and practical with constant soil sample impossible. Due to the concept on top of shared and can be enforced in agricultural difficulties of accurately measure dry soil and water fields in future to push agriculture to next level. The Volumes, volumetric water contents don't seem to be typically output from wetness sensing element and level system plays major determined directly. Role in producing theoutput

In this paper, the design and implementation of a smart irrigation system is presented. The design uses a system that allow the water to pass out as per soil necessity. This system saves electricity by making the use of naturally available solar energy. Compare drip irrigation systems driven by Brushless DC motor between time-based control and soil moisture sensor-based control. Irrigation system with time- based control requires a fixed amount of water and electricity for each irrigation period, while the drip irrigation system with soil moisture sensor-based control requires different amounts of water and electricity for each irrigation period according to conditions of planting media. The main advantage is that the system's action can be changed according to the situation. (crops, weather conditions, soiletc.)

By continuously monitoring the status of the soil, we can control the flow of water and thereby reduce the wastage. Conservation of water and labor: Since the systems are automatic, they do not require continuous monitoring by labor. This system avoids over irrigation, under irrigation, top soil erosion and reduce the wastage of water by Implementing this system, agricultural, horticultural lands, parks, gardens, golf courses can beirrigated.

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